NASA Procedural Requirements

COMPLIANCE IS MANDATORY

NPR 7120.5D
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Request Notification of Change (NASA Only)

Subject: NASA Space Flight Program and Project Management Requirements

Responsible Office: Office of the Chief Engineer

APPENDIX E. Program Plan Template

E.1 Template Instructions

The Program Plan is an agreement among the Program Manager, Center Director, and Mission Directorate Associate Administrator (MDAA). Other Center Directors providing a significant contribution to the program also concur with the Program Plan to document their commitment to provide required Center resources. The Program Plan defines the goals and objectives of the program, the environment within which the program operates, and the baseline commitments of the program, including identifying the high-level requirements on both the program and each constituent project. Project requirements may be in the body of the Plan or added as appendices. The Program Plan is to be updated and approved during the program life cycle if warranted by changes in the stated baseline commitments.

In this Program Plan template, all subordinate plans, collectively called Control Plans, are required. They are based on requirements in NASA Policy Directives (NPDs) and NASA Procedural Requirements (NPRs) that affect program/project planning. For tightly coupled programs, the SMA Plan, Risk Management Plan, and SEMP are required to be stand-alone plans with summaries and references provided in the Program Plan. The remaining Control Plans can either be part of the Program Plan or separate stand-alone documents referenced in the appropriate part of the Program Plan. In the case of the latter, the Program Plan contains a summary of and reference to the stand-alone document; the approval authority for the stand-alone Control Plan is the Program Manager.

Each section of the Program Plan template is required. If a section is not applicable to a particular program, indicate by stating that in the appropriate section and provide a rationale. If a section is applicable but the program desires to omit the section or parts of a section, then a waiver must be obtained in accordance with the waiver process for NPR 7120.5D. This waiver approval is documented in Part 4.0, Waivers Log, of the Program Plan

E.2 Program Plan Title Page

Program Plan

(Provide a title for the candidate program and designate a short title or proposed acronym in parenthesis, if appropriate.)

_____ _____

Mission Directorate Associate Administrator — Date

_____ _____

Center Director (as many signature lines as needed) — Date

_____ _____

Program Manager — Date

Figure E-1 Program Plan Title Page

E.3 Program Plan Template

PROGRAM PLAN

(PROGRAM TITLE)

1.0 PROGRAM OVERVIEW

1.1 INTRODUCTION

Briefly describe the background of the program and its current status, including results of formulation activities, decisions and documentation.

1.2 GOALS AND OBJECTIVES

State program goals and specific objectives, and provide clear traceability to the Agency's Needs, Goals, and Objectives and to Mission Directorate strategic goals and objectives. Program performance goals and their relationship to NASA program goals and objectives set forth in NPD 1001.1, *NASA Strategic Plan*, should be expressed in an objective, quantifiable, and measurable form. Goals and objectives should include specific commitments to Safety and mission success.

1.3 PROGRAM ARCHITECTURE

Briefly describe the architecture of the program, its major components, and the way they will be integrated. Describe how the major program components are intended to operate together, and with legacy systems, as applicable, to achieve program goals and objectives. Specify the type of program (i.e., single-project, uncoupled, loosely coupled, or tightly coupled) and the basis for that classification.

Provide a summary-level technical description of the program, including constituent projects and operations concepts. The description should also include mission description, program interfaces, facilities, logistics concepts, planned mission results, and data analysis, archiving, and reporting. Identify major constraints affecting program systems development (e.g., cost, launch window, required launch vehicle, mission planetary environment, fuel/engine design, and foreign partners).

Describe how the program will relate to other organizations within NASA and outside NASA. Reference Section 3.4, the Acquisition Plan of this document, or provide the following information here:

a. For organizations within NASA, describe the roles of each in the program, including technology efforts, space communications, and launch services.

b. For organizations outside NASA, describe the role of each in the program, including other government agencies, academia, industry, and international partners as they are known at the start of the program.

1.4 STAKEHOLDER DEFINITION

Identify the main stakeholders of the program (e.g., PI, Science community, technology community, public, Education community, Mission Directorate sponsor(s))and the process to be used within the program to ensure stakeholder advocacy.

1.5 PROGRAM AUTHORITY, MANAGEMENT APPROACH AND GOVERNANCE STRUCTURE

Describe the program management structure, including each participating organization's responsibilities. Identify:

a. The Center where the Program Manager Resides.

b. Each Centers' responsibilities, as they relate to their respective requirement allocations referenced in Section 2.1, Requirements Baseline, below.

Describe the chain of accountability and decision path outlining the roles and responsibilities of the MD sponsor(s), Program Manager, Center Director, and other authorities, as required

Provide a high-level description of the Projects' organization within the program, showing the chain of accountability. Describe clear lines of authority from projects and Centers to the program, and to the MD, and frequency of reporting for each. Illustrate the organization graphically. Describe the process by which projects are formulated, approved, and terminated.

1.6 IMPLEMENTATION APPROACH

Describe briefly the implementation approach of the program, including the acquisition strategy (e.g., in-house, NASA Centers, and contractor primes), partners, and partner contributions, if appropriate Include make-or-buy decision plans and trade studies.

Describe how participating NASA Centers' implementation policies and practices will be utilized in the execution of the program. (Note: For tightly coupled programs, the Program Manager, the NASA Chief Engineer, and the Center Chief Engineers (or designees) participating in the program establish the engineering best practices for the program. These decisions are documented here.) Document the agreements on the use of implementation policies and practices between the Program Manager and participating NASA Centers in this section (or in appendices to the document), along with the program's approach to ensuring that interfaces do not increase risk to mission success.

2.0 PROGRAM BASELINE

2.1 REQUIREMENTS BASELINE

a. Program Requirements.Document the high-level program requirements, including performance, safety, and programmatic requirements and correlate them to Agency and Mission Directorate strategic objectives and requirements. Describe the process by which program requirements are verified for compliance. Describe the process for controlling changes to program requirements. Document the traceability of requirements that flow down from program to projects.

b Requirements Documentation.For tightly coupled programs and single-project programs, decompose these high-level requirements into requirements on constituent projects or systems, specified herein or in a separate, configuration-controlled, program requirements document to be prepared by the Program Manager and approved by the MDAA Additional concurrences may be required at the option of the NASA AA. There may also be subordinate project requirements documents controlled at lower levels.

For uncoupled or loosely coupled programs, apply these high-level requirements to generate the programs' requirements on each constituent project. This documentation is controlled by the Mission Directorate and may be located in the body of the Program Plan or in a subsequent appendix. Requirements thus documented, and any subsequent changes, require approval of the Program Manager, MDAA, and participating Center Director(s).

c. Program Requirements on Projects.For each project, provide a top-level description, including the mission's science or exploration objectives. Document the project's category, governing PMC, and risk classification. Describe the project's mission, performance, and safety requirements. For science missions, include both baseline science requirements and threshold science requirements. (See Appendix A for definitions.) Identify the mission success criteria for each project based on the baseline science requirements. State each requirement in objective, quantifiable, and verifiable terms. Identify the project's principal schedule milestones, including PDR, CDR, launch, mission operational-critical milestones, and the planned decommissioning date. State the development and/or total life-cycle cost constraints on the project. Set forth any budget constraints by fiscal year. State the specific conditions under which a project Termination Review would be triggered. Describe any additional requirements on the project (e.g., international partners). If the mission characteristics indicate a greater emphasis is necessary on maintaining either technical, cost, or schedule, then identify which is most important (e.g., state if the mission is cost capped, or if schedule is paramount as for a planetary mission, or if it is critical to

accomplish all of the technical objectives as for a technology demonstration mission).

2.2 WBS BASELINE

Provide the program's WBS and WBS dictionary to the second level.

2.3 SCHEDULE BASELINE

Present a summary of the program's integrated master schedule (IMS), including all critical milestones, major events, and Agency and program-level reviews throughout the program life cycle. The summary schedule should include the logical relationships (interdependencies) for the critical milestones, major events, program reviews, and critical paths, as appropriate.

2.4 RESOURCE BASELINE

Present the program's funding requirements by fiscal year. State the NOA in real-year dollars for all years - prior, current, and remaining. The funding requirements are to be consistent with the program's WBS and include funding for all cost elements required by the Agency's full-cost accounting procedures. Provide a breakdown of the program's funding requirements to the WBS Level 2 elements.

Present the program-specific (i.e., not individual project) workforce requirements by fiscal year, consistent with the program's funding requirements and WBS.

Describe the program infrastructure requirements (acquisition, renovations, and/or use of real property/facilities, aircraft, personal property, and information technology). Identify means of meeting infrastructure requirements through synergy with other existing and planned programs and projects to avoid duplication of facilities and capabilities. Identify necessary upgrades or new developments, including those needed for environmental compliance.

3.0 PROGRAM CONTROL PLANS

3.1 TECHNICAL, SCHEDULE, AND COST CONTROL PLAN

Document how the program plans to control program requirements, technical design, schedule, and cost to achieve its high-level requirements. This control plan will include the following:

a. Describe the plan to monitor and control the requirements, technical design, schedule, and cost of the program.

b. Describe the program's performance measures in objective, quantifiable, and measurable terms and document how the measures are traced from the program high-level requirements. Establish goal and threshold values for the performance metrics to be achieved at each KDP, as appropriate; In addition, document the minimum mission success criteria associated with the high-level program requirements that, if not met, trigger consideration of a Termination Review.

c. Describe the program's Earned Value Management System (EVMS), if EVM requirements are to be levied at the program level.

d. Describe any additional specific tools the program will use to implement the program control processes, e.g., the requirements management system, the program scheduling system, the program information management systems.

e. Describe how the program will monitor and control the integrated master schedule (IMS).

f. Describe how the program will utilize its technical, schedule, and cost reserves to control the baseline.

g. Describe how the program plans to report technical, schedule, and cost status to the MDAA, including frequency and the level of detail.

h. Describe how the program will address technical waivers and how dissenting opinions will be handled.

3.2 SAFETY AND MISSION ASSURANCE PLAN

Develop a program SMA Plan. The SMA Plan addresses life-cycle SMA functions and activities. The plan identifies and documents program-specific SMA roles, responsibilities, and relationships. This is accomplished through a program-unique mission assurance process map and matrix developed and maintained by the program with appropriate support and guidance of the Headquarters and/or Center SMA organization.

The Plan reflects a program life-cycle SMA process perspective, addressing areas including: procurement, management, design and engineering, design verification and test, software design, software verification and test, manufacturing, manufacturing verification and test, operations, and pre-flight verification and test.

The Plan also addresses specific critical SMA disciplines including (as a minimum): safety per NPR 8715.3, *NASA Safety Manual*, and NPR 8705.2, *NASA Human Rating Requirements for Spaceflight Systems*; quality assurance per NPD 8730.5, *NASA Quality Assurance Program Policy*; compliance verification, audit, safety and mission assurance reviews, and safety and mission assurance process maps per NPR 8705.6, *Safety and Mission Assurance Audits, Reviews, and Assessments*; reliability and maintainability per NPD 8720.1B, *NASA Reliability and Maintainability (R&M) Program Policy*; software safety and assurance per NASA-STD-8719.13, *NASA Software Safety Standard*; and NASA-STD-8739.8, *NASA Software Assurance Standard*; quality assurance functions per NPR 8735.2, *Management of Government Quality Assurance Functions for NASA Contracts*; and other applicable NASA procedural safety and mission success requirements.

Describe how the program will develop and manage a Closed Loop Problem Reporting and Resolution System. Describe how the program develops, tracks, and resolves problems. The process should include a well-defined data collection system and process for hardware and software problem and anomaly reports, problem analysis, and corrective action.

For tightly coupled programs, reference the stand-alone SMA Plan here.

3.3 RISK MANAGEMENT PLAN

Summarize how the program will implement the NASA continuous risk management process in accordance with NPR 8000.4, *Risk Management Procedural Requirements*. Include the initial Significant Risk List and appropriate actions to mitigate each risk. Programs with international or other U.S. Government agency contributions must plan for, assess, and report on risks due to international or other government partners and plan for contingencies.

For tightly coupled programs, develop a stand-alone Risk Management Plan and reference the stand-alone Plan here.

3.4 ACQUISITION PLAN

The Program Acquisition Plan is developed by the Program Manager, supported by the Office of Procurement, and must be consistent with the results of the ASP meeting and the ASM. It documents an integrated acquisition strategy that enables the program to meet its mission objectives and provides the best value to NASA. In addition, the Acquisition Plan should:

a. Identify all major proposed acquisitions (such as engineering Design study, hardware and software development, and mission and data operations support) in relation to the program WBS. Provide summary information on each such proposed acquisition, including a Contract WBS; major deliverable items; type of procurement (competitive, AO for instruments); type of contract (cost-reimbursable, fixed-price); source (institutional, contractor, other U.S. Government agency, or international organization); procuring activity; and surveillance approach. Identify those major procurements that require a Procurement Strategy Meeting (PSM).

b. Describe completed or planned studies supporting make-or-buy decisions, considering NASA's in-house capabilities and the maintenance of NASA's core competencies, as well as cost and best overall value to NASA.

c. Identify the program's approach to creating Contractor incentives that strengthen safety and Mission assurance.

d. Describe how the program will establish and implement a continuous Risk-Based Acquisition Management (RBAM) process. (See Appendix A for definition.)

e. Describe all agreements, memoranda of understanding, barters, in-kind contributions, and other arrangements for collaborative and/or cooperative relationships. Include partnerships created through mechanisms other than those prescribed in the FAR. List all such agreements (the configuration control numbers and the date signed or projected dates of approval) necessary for program success. Include or reference all agreements concluded with the authority of the Program Manager and reference agreements concluded with the authority of the MDAA and above. Include the following:

(1 NASA agreements, e.g., space ;communications, launch services, inter-Center memoranda of agreement.

(2 Non-NASA agreements:

(i) Domestic, e.g., U.S. Government agencies.

(ii) International, e.g., memoranda of understanding.

3.5 TECHNOLOGY DEVELOPMENT PLAN

Describe the technology assessment, development, management, and acquisition strategies needed to achieve the program's mission objectives.

a. Describe how the program will assess its technology development requirements, including how the program will evaluate the feasibility, availability, readiness, cost, risk, and benefit of the new technologies.

b. Describe how the program will identify opportunities for leveraging ongoing technology efforts.

c. Describe the program's strategy for assuring that there are alternative development paths available if/when technologies do not mature as expected.

d. Describe how the program will remove technology gaps, including maturation, validation, and insertion plans, performance measurement at quantifiable milestones, decision gates, and resources required.

e. Describe briefly how the program will ensure that all planned Technology exchanges, contracts, and partnership agreements comply with all laws and regulations regarding export control and the transfer of sensitive and proprietary information.

f. Describe the program's technology utilization plan that meets the requirements of NPD 7500.2, *NASA Technology Commercialization Policy*, and NPR 7500.1, *NASA Technology Commercialization Process*.

3.6 SYSTEMS ENGINEERING MANAGEMENT PLAN

Summarize the key elements of the program Systems Engineering Management Plan (SEMP). Include descriptions of the Program's overall approach for systems engineering, to include system design and product realization processes (implementation and/or integration, verification and validation, and transition), as well as the technical management processes.

For tightly coupled programs, develop a stand-alone SEMP that includes the content required by NPR 7123.1, *NASA Systems Engineering Processes and Requirements*. Reference the stand-alone Plan here.

3.7 REVIEW PLAN

Summarize the program's approach for conducting a continuum of reviews for the program life cycle, including peer reviews. In accordance with Center best practices, MD review requirements, and the requirements in NPR 7123.1, *NASA Systems Engineering Processes and Requirements*, provide the names, purposes, content, and timing of the critical milestone reviews.

Explain the reporting requirements for program reviews. Provide the technical, scientific, schedule, cost, and other criteria that will be utilized in the consideration of a Termination Review.

For tightly coupled programs that involve multiple Centers, document the program review requirements on the supporting projects that represent an integrated review process for the various projects and take into consideration the participating Centers' review process best practices.

3.8 MISSION OPERATIONS PLAN

This section is required only for tightly coupled and single-project programs. For those programs, describe the activities required to perform the mission. Describe how the program will implement the associated facilities, hardware, software, and procedures required to complete the mission. Describe mission operations plans, rules, and constraints. Describe the Mission Operations System (MOS) and Ground Data System (GDS) in the following terms:

a. MOS and GDS human resources and training requirements.

b. Procedures to ensure that operations are conducted in a reliable, consistent, and controlled manner using lessons learned during the program and from previous programs.

c. Facilities requirements (offices, conference rooms, operations areas, simulators, and test beds).

d. Hardware (ground-based communications and computing hardware and associated documentation).

e. Software (ground-based software and associated documentation).

3.9 ENVIRONMENTAL MANAGEMENT PLAN

Describe the activities to be conducted to comply with NPR 8580.1, *Implementing the National Environmental Policy Act and Executive Order 12114*

3.10 LOGISTICS PLAN

Describe how the program will implement NPD 7500.1B, *Program and Project Logistics Policy*, including integrated logistics infrastructure for supply support, maintenance, test and support equipment, training, technical documentation, packaging, handling and transportation, and logistics information systems for the life of the program.

3.11 SCIENCE DATA MANAGEMENT PLAN

Describe how the program will manage the scientific data generated and captured by the operational mission(s) and any samples collected and returned for analysis. Include descriptions of how data will be generated, processed, distributed, analyzed, and archived, as well as how any samples will be collected, stored during the mission, and managed when returned to Earth. The Plan should include definition of data rights and services and access to samples, as appropriate. Explain how the program will accomplish the knowledge capture and information management and disposition requirements in NPD 2200.1 *, Management of NASA Scientific and Technical Information,* NPR 2200.2B, *Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information,* NPR 1441.1*, Records Retention Schedules*, as applicable to program science data.

State futher that the program will adhere to all NASA sample handling, curation, and planetary protection directives and rules, including NPR 8020.12C, *Planetary Protection Provisions for Robotic Extraterrestrial Missions*.

3.12 INFORMATION AND CONFIGURATION MANAGEMENT PLAN

Describe the configuration management (CM) approach that the program team will implement, consistent with NPR 7123.1. Describe the structure of the CM organization and tools to be used. Describe the methods and procedures to be used for configuration identification, configuration control, interface management, configuration traceability, and configuration status accounting and communications. Describe how CM will be audited and how contractor CM processes will be integrated with the program. Reference the stand-alone program Configuration Management Plan, if applicable.

Describe how the program will manage information throughout its life cycle, including the development and maintenance of an electronic program library. Explain how the program will ensure identification, control, and disposition of program records in accordance with NPD 1440.6 *, NASA Records Management,* and NPR 1441.1*, Records Retention Schedules.*

Describe the program's approach to knowledge capture, as well as the methods for contributing knowledge to other entities and systems, including compliance with NPD 2200.1*, Management of NASA Scientific and Technical Information*, and NPR 2200.2B*, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information*.

Describe the program's approach to capturing lessons learned in accordance with NPR 7120.6, *Lessons Learned Process*.

3.13 SECURITY PLAN

Describe the program's plans for ensuring security and technology protection, including:

a. Security Requirements: Describe the program' approach for planning and implementing the requirements for information, physical, personnel, industrial, and counterintelligence/counterterrorism security, and for security awareness/education requirements in accordance with NPR 1600.1*, Security Program Procedural Requirements*, and NPD 1600.2, *NASA Security Policy*. Include in the plan provisions to protect personnel, facilities, mission-essential infrastructure, and critical program information from potential threats and other vulnerabilities that may be identified during the threat and vulnerability assessment process.

b. Information Technology (IT) Security Requirements: Document the program's approach to implementing IT security requirements in accordance with NPR 2810.1, *Security of Information Technology.*

c. Emergency Response Requirements: Describe the program's emergency response plan in accordance with NPR 1040.1, *NASA Continuity of Operations (COOP) Planning Procedural Requirements*, and define the range and scope of potential crises and specific response actions, timing of notifications and actions, and responsibilities of key individuals.

3.14& EXPORT CONTROL PLAN

Describe how the program will implement the export control requirements specified in NPR 2190.1, *NASA Export Control Program*.

3.15 EDUCATION AND PUBLIC OUTREACH PLAN

Describe planned efforts and activities to improve science literacy by engaging the public in understanding the program, its objectives, and benefits. Summarize plans to develop education activities, services, and products that contribute to our Nation's efforts in achieving excellence in science, technology, engineering, and mathematics (STEM) education or to stimulate interest in STEM through program-related public outreach activities Specifically, address how planned efforts will:

a. Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals.

b. Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

c. Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

Summarize the plan to flow the Education and Public Outreach (EPO) requirements to projects within the program.

4.0 WAIVERS LOG

Identify NPR 7120.5D requirements for which a waiver has been requested and approved consistent with program characteristics such as scope, complexity, visibility, cost, safety, and acceptable risk, and provide rationale and approvals.

5.0 CHANGE LOG

Record changes to the Program Plan.

6.0 APPENDICES

Appendix A Acronyms

Appendix B Definitions

| TOC | Preface | Chapter1 | Chapter2 | Chapter3 | Chapter4 |
AppendixA | AppendixB | AppendixC | AppendixD | AppendixE |
AppendixF | AppendixG | AppendixH | AppendixI | Figure2-2 | ALL |

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